

even sold cable customers to Comcast in exchange for the right to sell AT&T-branded telephone services to Comcast cable subscribers in a joint venture with Comcast.⁴⁹

AT&T has compelling reasons to enter the local phone business. If AT&T doesn't offer telephone services over its cable systems, it is likely to lose further market share in long distance. Companies that offer bundles of communications services may take business away from companies that offer single services. Moreover, AT&T is well aware that at least one of the former Bell Operating Companies (BOCs) is likely to win regulatory approval in the near future to enter AT&T's core long distance business.⁵⁰ Experience in Connecticut with SNET has shown that large numbers of customers will change long distance carriers when they are offered a single package of local and long distance.⁵¹ Thus, offering a bundle of services including local telephone service, broadband Internet access and long distance will help to protect AT&T's long distance service revenues. Indeed, offering bundles of communications services including local voice service as a way of protecting its long distance market has been in AT&T's plans since 1996, well before it acquired cable companies.⁵²

Based on customer surveys and focus groups done last year, AT&T says that two-thirds of all customers and more than 90% of high-volume users want to buy a bundle.⁵³ If AT&T doesn't sell consumers a bundle, someone else will, and AT&T will lose long distance revenues; if AT&T sells the bundle, it will regain some of its lost share of the long distance market. Since Sprint customers spend about 2.5 times what AT&T customers spend on long distance service, and MCI customers outspend AT&T

⁴⁹ See "AT&T and Comcast agree to swap cable systems," AT&T press release, 5/4/99, <http://www.att.com/press/item/0,1193,467,00.html>.

⁵⁰ See "AT&T Has Set Itself Some Tough Challenges," *New York Times*, 4/26/99.

⁵¹ *Id.* The *New York Times* has stated: "Large numbers of Connecticut customers dropped long distance service from AT&T, among others, to take a single package of local and long distance from S.N.E.T. AT&T's strategic planners hate to contemplate the millions of local phone customers who might drop AT&T phone service once Bell Atlantic is freed to offer long-distance service to customers along the Eastern Seaboard, or even just in New York... Mr. Armstrong has decided that the solution is to counterattack the Bells by taking the war to a new front — off the conventional local telephone network and onto cable TV systems. Through those cable lines, AT&T intends to offer local and long-distance calling, as well as Internet service."

⁵² See section 2.4.8, below, for the genesis of AT&T's plans for bundling services.

⁵³ *Forbes*, April 19, 1999 p190(1).

customers about 1.8 times,⁵⁴ AT&T will do well to reclaim customers from Sprint and MCI. Selling local services will also foster a relationship with customers the likes of which AT&T hasn't had since it divested the local operating companies. AT&T would also save on the per-minute access charges paid by long distance carriers by offering local phone service. In short, the benefits to AT&T of offering local telephone service are not limited to the profits to be made from local telephone service; offering local phone service will also make AT&T's long distance service more profitable.

Aside from considerations of AT&T's strategy in phone markets, investment in the facilities necessary to provide phone service is attractive simply because provision of local phone service by cable operators is profitable. The FCC reports that profit margins for local phone service by cable operators are in the range of 40%, and that this level of profit is high enough to encourage further investment.⁵⁵ The assumption that AT&T will offer local phone services, then, is well founded.

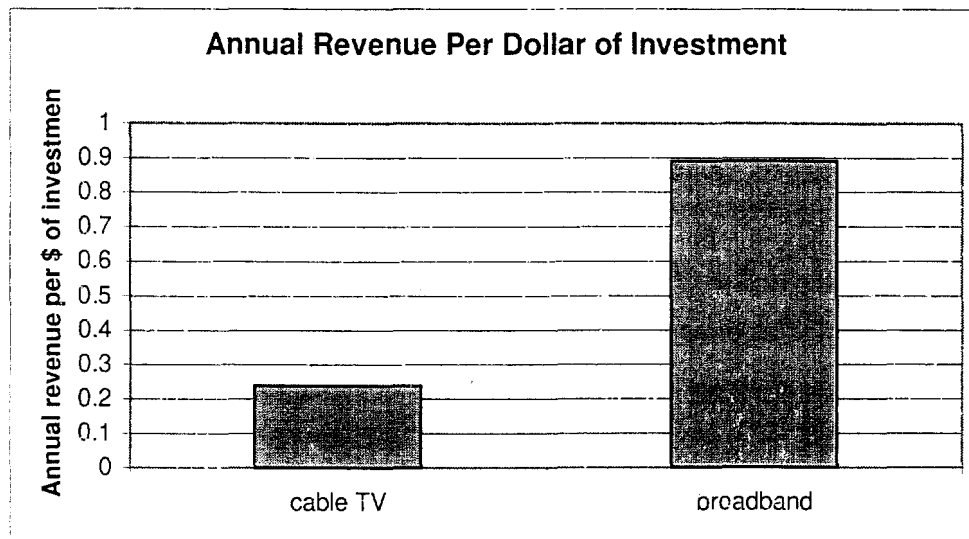
2.4.6. Quantitative Investment Analysis Results: Broadband Given Joint Phone Facilities

I next analyze AT&T's decision to invest in broadband Internet last-mile transport facilities assuming that AT&T has already committed to build local phone facilities, some of which would also support broadband Internet transport. Once we recognize that AT&T will go ahead with local telephony independently of broadband Internet transport, the already strong case for making the necessary incremental broadband Internet investment is much stronger. The reason is simple: the *incremental* investment necessary to provide broadband Internet access is quite small, since the provision of telephone

⁵⁴ See "What me worry?," *Fortune*, September 30, 1996 v134 n6 p121(4)

⁵⁵ "Additional market launches [of local phone service on cable systems] are planned since [penetration] has been ranging 10%-19%, and profit margins for cable telephony are in the range of 40%." (Annual Assessment of the Status of Competition in Markets for the Delivery of *Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, pp. 38-39).

service by itself requires the hybrid fiber-coaxial (HFC) network and two-way activation.⁵⁶



See Appendix B for details

Under open access, the revenue per dollar of investment from broadband last-mile transport facilities, despite my conservative assumptions, is 273% of, or 3.7 times the revenue per dollar of investment from cable services alone. Thus, the return from investment is 3.7 times the normal rate of return.⁵⁷ This is overwhelmingly above the critical level necessary to warrant investment. Foregoing such a lucrative investment opportunity would not make any sense, and would be contrary to the interests of AT&T's shareholders.

2.4.7. Other Estimates Of The Profitability Of Investment In Broadband Facilities

There is substantial agreement that broadband Internet investments by cable companies are very profitable. Jupiter Communications estimates that revenues generated by investments in last-mile broadband Internet transport will pay off their investment in only

⁵⁶ Milo Medin, Chief Technology Officer for @Home, said in a recent interview that "Since data services don't have the same power requirements as voice, we'll be ready for broadband data before voice" (*Wired Magazine*, April 1999, <http://www.wired.com/wired/archive/7.04/medin.html>).

two to three years.⁵⁸ Credit Suisse First Boston Corporation says that “the marginal returns on capital are... many multiples higher than average cable returns today.” It calculates payback periods for wireline telephone service of 2.6 years, 1.4 years for cable modem service.⁵⁹ As mentioned above, the FCC reports that profit margins for local phone service by cable operators are high enough to encourage further investment.

2.4.8. The Bright Side

My analysis of AT&T’s investment decision has thus far employed an extremely conservative, worst case scenario. Under more reasonable assumptions, the case for broadband investment with open access would be even stronger. While I have pointed out the unreasonableness of many of the worst-case assumptions, I have not yet touched on other reasons to believe that investment in local telephone and broadband Internet last-mile facilities will be excellent opportunity for AT&T.

In contrast to the extremely conservative assumptions I have made, the fact is that Excite@Home and Road Runner can be expected to retain significant market share in an open access environment. Both have already established a strong market presence, and there is value for consumers in their networks and content. Thus, AT&T should obtain significant profits from these services even under open access.

While the cost estimate used in my calculations assumed a cable modem penetration rate of 10%,⁶⁰ there is good reason to believe that AT&T will experience higher penetration rates. The cost per subscriber declines as the penetration rate increases, so profitability will be higher with higher penetration rates. The penetration rate for local telephone

⁵⁷ Under the reasonable assumptions explained in Section 2.4.4. See Appendix B for a detailed explanation.

⁵⁸ See “Last-mile Strategies,” Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>).

⁵⁹ These estimates exclude the cost of cable system upgrades but include costs of operations. See “Media One Group,” Credit Suisse First Boston Corporation report, 1/7/99. Their estimates are expressed in terms of return on invested capital, ROIC, annual income divided by investment, which is the inverse of the payback period; I present payback periods for convenience of comparison with other estimates.

⁶⁰ See “Last-mile Strategies,” Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>).

service experienced by other cable operators ranges from 10% to 20%.⁶¹ AT&T, with its reputation in telecommunications, is likely to experience penetration rates in excess of 20%. In Britain, where cable operators have offered local phone service for about a year longer than in the U.S., the telephony penetration rate for one cable operator, NTL, is 40% in most of its licensed areas.⁶² One of the reasons for NTL's success is that it offers a bundle of communications services.⁶³

As stated, bundling telecommunications services is also AT&T's strategy. AT&T has planned to bundle services since before it acquired cable companies; the strategy was developed years ago to address the fact that AT&T was receiving less revenue per residential customer than were MCI or Sprint.⁶⁴ Through bundling, AT&T seeks to reduce costs and lock in customers, reducing churn.⁶⁵ Analysts agree that bundling will be a successful strategy. AT&T says that its studies show that the majority of consumers, and the vast majority of high volume consumers, say that they would like to buy a bundle of communications services.⁶⁶ Further, the FCC has recognized that:

Multi-service offerings and bundling services for sale seem to enhance subscription to alternative services offered by cable companies... [T]elephony and Internet access through cable modems are becoming high demand services... Indications are that customers value receiving these services through 'one stop shopping.' For example, many large MSOs have found that bundling increases penetration of video and of new services. MSOs, such as Cox, MediaOne, Jones, and Cablevision, indicate that bundling their services increases consumer

⁶¹ *Telephony*; Chicago; Mar 1, 1999; Blair King; Mitch Matteau; Volume: 236 Issue: 9 Start Page: 38. The FCC also reports penetration rates of up to 20% in some areas. See *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 20.

⁶² See "Telecom-to-order," *Forbes*, July 27, 1998, and "The front line: multimedia in Britain", *The Economist*, Oct 26, 1996 v341 n7989 p84(2).

⁶³ "What makes NTL unique is that it already bundles telephone service, cable and Internet access into a single service... NTL's low-cost multichoice strategy is helping it build market share: The company has a 40% penetration rate in most of its licensed areas-almost twice that of any competitor." ("Telecom-to-order," *Forbes*, July 27, 1998).

⁶⁴ "What me worry?," *Fortune*, September 30, 1996 v134 n6 p121(4).

⁶⁵ *Id.*

⁶⁶ AT&T President John Zeglis, basing his statement on recent customer surveys and focus groups, said that two-thirds of all customers and more than 90% of high-volume users want to buy a bundle. (*Forbes*, April 19, 1999 p190(1)). 55% of consumers studied by one analyst said they preferred to purchase communications services from a single company (1998 *MultiMedia Telecommunications Market Review and Forecast*, Telecommunications Industry Association/MultiMedia Telecommunications Association, 1998, p. 39, citing Price Waterhouse/Kenan Systems).

awareness, interest, and ultimately penetration of services while saving on administrative and marketing costs.⁶⁷

Forrester Research says that its studies show that “connectivity bundling will work if packages are built around households’ most expensive services... The key to a successful bundling strategy is the core service — a household’s most expensive connectivity service. In the United States, cable TV (36%) and local telephone (31%) are the leading core services, followed by long distance (23%), cellular phone (7%), satellite TV (5%), and the Internet (1%).” AT&T’s plans are the very model of a successful bundling strategy, as described by Forrester.⁶⁸

In fact, open access would contribute to the success of AT&T’s bundling strategy. As explained in the second half of the paper, there will be more cable modem subscribers if open access is implemented. The more cable modem subscribers there are, the more consumers there will be who will be able to benefit by bundling cable modem service with phone service. Further, since unaffiliated ISPs will not be able to offer cable TV or phone service in addition to ISP service, those customers who want *all* communications services bundled will purchase from AT&T and its affiliated ISPs despite open access: that is, open access does not remove the fully bundled option that AT&T offers.

2.5. Investment Won’t Be Slowed By Open Access

The cable industry has argued that even if broadband investment is still advisable under open access, the pace of investment might be slowed.⁶⁹ However, as a prominent analyst explained:

“There is a race to be first to offer Internet access and ultimately telephone service to the upscale neighborhoods that will buy it first,” said Howard Anderson, president of the Yankee Group, a media consulting firm. “It’s called the ‘first-

⁶⁷ Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 40.

⁶⁸ See “Forrester’s Technographics® Sees Market Opportunity For Bundled Voice, Internet, And TV Services,” Forrester Research press release, 9/18/98, (<http://www.forrester.com/ER/Press/Releases/Standard/0,1358,17,FF.html>).

⁶⁹ This was one of the major issues discussed during the San Francisco franchise transfer proceeding in the summer of 1999, for example.

mover advantage.’ If customers go with the phone companies, it will be hard, if not impossible to lure them back to cable.”⁷⁰

Consumers’ habits, the cost of learning technology, and the cost of switching equipment, such as trading DSL modems for cable modems, are reasons why customers would be reluctant to switch to cable modem service after having subscribed to DSL.⁷¹ Delaying investment in broadband cable facilities, and thereby losing a substantial share of the market, is not a sensible strategy for cable operators. In fact, as I show in section 2.6, companies in an open access environment are investing very rapidly in broadband last-mile facilities.

2.6. Market Evidence of Investment in Broadband Last-Mile Facilities Under Open Access

Some broadband last-mile carriers currently are subject to open access obligations, and have nonetheless invested vigorously in broadband facilities. Incumbent U.S. local telephone companies are required by law to offer open access, and they are investing in DSL facilities. The BOCs and GTE, for example, have announced plans to offer DSL broadband services to approximately twenty million homes this year, about 20% of the country.⁷² While deployment is slower than the cable companies, DSL has been

⁷⁰ “2 Huge Cable TV Companies to Unite in \$53 Billion Deal,” *New York Times*, 3/23/99.

⁷¹ These effects were discussed in more detail above, in section 2.5.

⁷² *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, p. 21-22

hampered by uncertainty about standards.⁷³ With the approval of the DSL-lite standard, investment in DSL is expected to accelerate dramatically.⁷⁴

If economists could perform controlled experiments, they might do something like this: find another country similar to the country of interest, and impose a policy change in the second country but not in the first; study the effect of the change in both countries. As it happens, we have evidence of just that sort from Canada, where the requirement to provide open access was announced in January, 1996.⁷⁵ The major Canadian cable operators are investing quite rapidly, and are ahead of the major U.S. cable operators in broadband facilities deployment. As noted below in Section 3.4, the Canadian Cable Television Association, *the group that represents Canadian cable operators*, is on record as being committed to the implementation of open access because it *believes open access it is in the cable companies' financial interest*.⁷⁶ Four of the five largest cable companies in Canada are affiliated with Excite@Home.⁷⁷ Tom Jermoluk, then Chairman, President and CEO of @Home Network said that, "[d]ue to our partners' [cable companies'] *strong commitment to advancing two-way network rebuilds*, Canada is a tremendous market for high-speed cable Internet services."⁷⁸ There were more than two million Canadian

⁷³ "Many regional phone companies have yet to offer the service. It's currently available in a limited number of markets. Part of the reason for this holdup is that the telcos haven't agreed on technical standards for ADSL yet. They have the same worries you do about investing in a soon-to-be-orphaned technology, with millions of dollars at stake" ("DSL vs. The World," *PC Computing*, January, 1998. (<http://www.zdnet.com/products/content/pccg/1101/259442.html>)). The article goes on to describe several varieties of DSL, including CAP, DMT, Rate-adaptive DSL, HDSL, IDSL, SDSL, and VDSL. Forrester Research believes that DSL has been held back by competing technologies and a lack of standards ("High-speed Internet Access To Reach 16 Million U.S. Households By 2002 According to Forrester," Forrester Research press release, 9/1/98, www.forrester.com/ER/Press/Releases/Standard/0,1358,21,FF.html).

⁷⁴ See "ADSL Will Overtake Cable," *Wired News*, 12/18/98, <http://www.wired.com/news/news/technology/story/16922.html>, and "High-Speed Access Leaps Hurdle," *Wired News*, 10/23/98, <http://www.wired.com/news/news/technology/story/15783.html>.

⁷⁵ See Telecom Decision CRTC 96-1, 1/30/96, www.crtc.gc.ca/eng/telecom/decision/1996/d961%5FO.txt.

⁷⁶ See footnote 110.

⁷⁷ See "@Home Network and Vicon CableSystems, Inc. Announce Agreement for Delivering High-Speed Cable Internet Services in Canada; Four of the Top Five Canadian Cable Operators Now Affiliated with @Home Network," Excite@Home press release, 3/18/99, http://www.home.net/news/pr_990318_01.html

⁷⁸ "@Home Network, Rogers CableSystems, and Shaw Communications Announces the Creation of WAVE@HOME," Excite@Home press release, April 10, 1997

(http://www.home.net/news/pr_970410_01.html). Emphasis supplied.

households passed by broadband Internet transport carriers as early as the end of 1997, in a market with only between 7.5 and 10 million homes passed by cable.⁷⁹

Canada's largest cable operator, Rogers Communications, invested in cable upgrades more rapidly than any of the major U.S. cable operators. *The Wall Street Journal* reports that Rogers invested so rapidly that it "alarmed critics," but Rogers expects that the investments it is making "will mean even higher revenue later, when it will be able to offer a wealth of new products and services, including ... high-speed Internet access."⁸⁰ Currently, 85% of Rogers network is currently capable of providing broadband Internet last-mile transport.⁸¹

Shaw Communications, Canada's third largest cable operator, is not far behind Rogers in investment in broadband technology, and, like Rogers, is ahead of every U.S. cable operator. In a 1998 proceeding before the Canadian commission, Shaw said that it is spending an amount equal to 30% of its gross revenues on upgrading its systems and deploying digital technology.⁸² In 1999, Shaw accelerated its deployment of its broadband network.⁸³ Currently, approximately 70% of its systems are ready to offer broadband Internet last-mile transport, and Shaw expects its systems upgrade to be complete by November, 1999.⁸⁴

⁷⁹ An @Home press release says that "Shaw Communications... is one of Canada's largest cable television operators with approximately 1.5 million homes and serving about 20% of the Canadian market," implying a market size is about 7.5 million homes. It also says "[t]his service will reach approximately five million households, representing more than 50 percent of the Canadian cable television market," implying a market size of almost 10 million households ("@Home Network, Rogers CableSystems, and Shaw Communications Announces the Creation of WAVE@HOME," Excite@Home press release, April 10, 1997, http://www.home.net/news/pr_970410_01.html).

⁸⁰ See "Rogers Communications's (*sic.*) Vision Will Soon Be Tested," *Wall Street Journal*, 7/31/97

⁸¹ Rogers@Home launches multiple computer access, 05/06/99,

<http://www.rogers.com/rogers/investor/media/index.html>.

⁸² Shaw Communications, Inc.'s comments in response to Broadcasting Public Notice CRTC 98-82, p. 6. (http://www.crtc.gc.ca/eng/proc_br/notices/1998/pn98-82/col80.doc).

⁸³ "SHAW announces plans to accelerate the deployment of its interactive network to serve all of its customers," 05/14/99, <http://www.shaw.ca>.

⁸⁴ One of my sources implies that Shaw's network is 69% upgraded for broadband Internet access, the other implies 74%. "SHAW announces plans to accelerate the deployment of its interactive network to serve all of its customers," 05/14/99, <http://www.shaw.ca>. says, "SHAW Communications today announced that it is accelerating the deployment of two-way networks in all of its Class I and II cable systems to enable it to offer interactive services such as Shaw@Home high speed Internet and digital services to the remainder of its 1.8 million customers (2.3 million homes passed). This initiative will be completed within six months.

3. Open Access Yields More Broadband Last-mile Transport Revenue

In the first part of this paper, I presented an economic analysis that demonstrates open access will not deter cable companies from investing in broadband last-mile facilities. In the second half of the paper, I show that (contrary to my conservative assumptions in the previous analysis) cable companies would earn *more broadband last-mile transport revenue* in an open access environment than in an exclusive access environment. As explained in Section 2.1.1 above, *ISP income* may be lower in an open access environment. The effect of an open access requirement on cable companies' profitability is the sum of these positive and negative effects. Indeed, Merrill Lynch has stated that AT&T's earnings would benefit if it were to offer access to independent ISPs.⁸⁵

Broadband last-mile transport revenue would increase because open access would increase consumer demand for cable modem service. Since open access would not diminish cable operators' market power over broadband *transport*, they could sell the greater quantities at the same or a higher price. That is, more consumers would be willing to pay the same or higher price and revenues would necessarily increase.⁸⁶

More consumers would subscribe to cable modem service under open access because:

- ISP competition would foster lower prices, improved service quality, and increase innovation;

Over 550,000 customers in the following communities will benefit from this initiative." This implies that $(1.8 - 0.55) / 1.8 = 69\%$ of customers have access to Shaw@Home. Another source, Campbell, G.D., "Shaw Communications Inc. Canada, Media – Cable Winning at Home," *Merrill Lynch Capital Markets*, 01/21/99, says that "Shaw continues to lead North America with its At-Home subscribers, which totaled 58,446 at November 30 and 71,126 at December 31 -- a remarkable 6.4% of "homes launched". This implies that $71,126 / .064 = 1.111$ million homes were passed by Shaw@Home service. Shaw passes 1.5 million homes ("@Home Network, Rogers CableSystems, and Shaw Communications Announces the Creation of WAVE@HOME," Excite@Home press release, April 10, 1997, http://www.home.net/news/pr_970410_01.html), so $1.111 / 1.5 = 74\%$ of homes passed by Shaw cable is also passed by Shaw@Home.

⁸⁵ "We believe that ultimately AT&T and ISPs such as AOL will reach a compromise whereby AT&T agrees to sell cable modem access unbundled from the @Home ISP service to ISPs at a to be determined price... While this would subject AT&T to additional competition, we believe that it would also provide a strong wholesale revenue channel and provide potential future earnings benefits." (Merrill Lynch analyst's report, "AT&T Gets UMG and (Amazingly) Comcast JV Without Bidding War – Very Positive!," 5/7/99)

⁸⁶ See section 2.1 above for a brief discussion of market power in the broadband last-mile transport market. A more detailed discussion of market definition and market power is in Appendix A.

- consumers value variety, so more consumers would subscribe if there were more choice among ISPs;
- ISPs would help migrate their current dial-up narrowband subscribers to cable modem service.

I address each of these in turn.

3.1. The value of competition

The benefits of market competition scarcely need elaboration, so I will be brief. ISPs competing for customers they could reach over the broadband last-mile network would have greater incentive to keep prices low and quality high than if the vertically-affiliated ISP were the exclusive provider.⁸⁷ This would attract subscribers to the cable broadband network, and increase broadband transport revenue.

3.2. The value of variety

3.2.1 Consumers value variety

There can be no doubt that consumers value variety. Consumers have heterogeneous tastes, and a wide variety of products or services will increase both aggregate consumer welfare and demand. The Supreme Court recognizes that restriction of product variety harms consumers:

A refusal to compete with respect to the package of services offered to customers, no less than a refusal to compete with respect to the price term of an agreement, impairs the ability of the market to advance social welfare by ensuring the provision of desired goods and services to consumers at a price approximating the marginal cost of providing them.⁸⁸

⁸⁷ In a proceeding in Canada, where the same issues are being confronted, AT&T Canada Long Distance Services noted the importance of competition to the development of the broadband industry: "If the bottleneck nature of these services [cable broadband last-mile transport] is not recognized, the establishment of a competitive market may be jeopardized, and more significantly, undermine the development of Canada's Information Highway, contrary to the Federal Government's stated policy objective to create a network of interconnecting networks." (AT&T Canada Long Distance Services' Comments in Response to Telecom Public Notice 96-36, 2/4/97, p. 2 (emphasis supplied) (<http://www.crtc.gc.ca/internet/1997/pn's/pn96-36/at&T/pn9636.doc>)).

⁸⁸ *FTC v. Indiana Federation of Dentists*, 476 U.S. 447 (1986).

Econometric studies have found that the value to consumers of even just one or a few additional choices is substantial, even when they already have many choices.⁸⁹

3.2.2. Variety in ISPs' offerings

In an open access environment, there would be a great deal of variety in ISP offerings on the cable network. There are a large number of firms competing in the ISP industry. Entry and exit are easy. In such a tough competitive environment, product differentiation is an important competitive strategy. ISPs have found myriad ways of making their services stand out among the others. The fact that ISPs offer such a wide variety of services and market themselves to such diverse niches is strong evidence that consumers value variety in ISP offerings.

ISPs differentiate themselves by

- price⁹⁰
- transmission quality⁹¹
- availability and capacity of local access numbers⁹²

⁸⁹ For example,

- One study estimated the value to consumers of a new variety of ready-to-eat cereal, Apple-Cinnamon Cheerios. Despite the existence of similar cereals, such as Honey-Nut Cheerios, and the frequent introduction of other new brands of cereals, the study found that the value of the new brand was substantial. (J. Hausman, "Valuation of New Goods Under Perfect and Imperfect Competition," T. Bresnahan and R. Gordon, eds., *The Economics of New Goods*, University of Chicago Press, 1997)
- A study of the value to consumers of the introduction of the minivan found that the average minivan purchaser was made better off by \$1,772 by being able to buy a minivan. (A. Petrin, 1999, "Quantifying the Benefits of New Products: The Case of the Minivan," manuscript, University of Chicago Business School, available at <http://gsbwww.uchicago.edu/fac/amil.petrin/research/minivan.pdf>, verified 7/1/99)
- Another study of the automobile market found that when a boycott of Israel by most Japanese and Korean car manufacturer was lifted, there was an increase in consumer welfare of \$2,343 per car purchaser, primarily due to increased variety. (C. Fershtman and N. Gandal, "The effect of the Arab boycott on Israel: the automobile market," *RAND Journal of Economics* 29: 193-214 Spring 1998)

⁹⁰ While many ISPs charge about \$20/mo., there are many examples of strong price competition. For example, ZZAPP! offers service including 56Kbps transmission, a personal Web page with 10 megabytes of space, four e-mail boxes, spam filtering, and unlimited file transfer service for only \$12.95/mo. (<http://www.zzapp.org>).

⁹¹ Many ISPs advertise the quality of their facilities and their Internet backbone carrier's facilities. For example, Glenn Network One offers "all digital lines (T1 or better in every POP)", "single hop to the backbone," and "Dual backbone providers for reliable service – we use backbones rated with the best bandwidths by Boardwatch Magazine" (<http://www.gn1.net>). @Home advertises end-to-end networks and special caching arrangements.

- customer service
- form of subscription contract (such as unlimited vs. measured usage)⁹³
- length of service contract⁹⁴
- compatibility with various operating systems
- e-mail offers, like multiple addresses
- Web hosting
- local access lines that offer faster service⁹⁵
- popular software for Internet tasks like file transfer and e-mail, instant messaging, and spam filtering⁹⁶
- training
- service in foreign languages⁹⁷
- affiliations with other Internet firms to provide their subscribers with special services and discounts
- proprietary content

No single ISP can be expected to duplicate the variety found among all the ISPs in the market. Yet without open access, nearly all consumers will have no choice over an ISP for cable modem service. Consumers for whom the services offered by their favorite ISP are more important than any advantages the consumer perceives in cable modem service over other forms of local transport will use other forms of local transport, such as DSL or narrowband services, to the loss of the cable operator.

⁹² Glinn Network One advertises "No busy signals (Limited to 0.7% of all calls attempted)" (<http://www.gnl.net>).

⁹³ For example, Prodigy offers 10 hours of usage for \$9.95/mo, unlimited usage for \$19.95/mo, and, for \$21.95/mo, unlimited usage plus five additional mailboxes.

⁹⁴ Prodigy subscribers who pre-pay for a year save 20% (<http://www.prodigy.com>). Glinn Network One offers service for \$15.95/mo, \$14.95/mo with 3 month prepayment, \$13.95/mo with six month prepayment, and \$12.95/mo with prepayment for a year (<http://www.gnl.net>).

⁹⁵ For example, NetLink Resource Group, Inc. offers access by voice grade phone line, 64Kbps ISDN, 128Kbps ISDN, "burstable" fractional T-1 with committed 256Kbps service and bursts up to 1.54Mbps, and dedicated 1.54Mbps T-1 with committed rate of 512Kbps (<http://www.netlinkrg.com>). Slip.net also has a wide variety of local access lines (<http://www.slip.net>).

⁹⁶ Spam is the junk mail of the Internet. Mindspring advertises "The Spaminator" (<http://www.mindspring.com>). ZZAPP! also offers spam filtering (<http://www.zzapp.org>).

⁹⁷ For example, Azteca.net offers service and support in English, Spanish, Portuguese, and Japanese (<http://www.Azteca.net>).

3.2.3. ISP market niches

Marketing to particular demographic groups or communities is another competitive strategy that produces variety in ISP offerings. In this way, ISPs become cyber communities. Many geographically specialized ISPs, such as Wild Apache Internet Service, offer local content.⁹⁸ Some ISPs are owned and operated by minority groups, such as Native Americans⁹⁹ and gays, like Glinn Network One.¹⁰⁰ ISPs have arisen to serve African Americans (NetNoir), Hispanics (Quepasa.com), Asian Americans (Asian Avenue), and college students (Collegeclub.com).¹⁰¹ Some offer their subscribers specialized links of interest to specific communities, like those interested in promoting Christian and family values,¹⁰² and Catholics.¹⁰³ Others offer specialized services, like filtering of objectionable content.¹⁰⁴

One might ask what value there is in ISPs serving as cyber communities. Don't ordinary Web sites do the same thing? The most straightforward answer is, consumers *like* buying from ISPs that market to their demographic group, and that's all we really need to know. The value they receive from variety is demonstrated by their purchases. We can speculate that some subscribers may like the convenience of having an array of content

⁹⁸ For example, Wild Apache Internet Service (<http://www.wildapache.net>) is a small ISP in Clarksdale, Arizona. It has information about local events, the Verde Valley Library hours, links to local organizations such as the Verde Valley Computer Club, and many American Indian links, such as links to the Web site of the Yavapai-Apache Nation, which is hosted by Wild Apache Internet Service.

⁹⁹ Native Voices International's site (<http://www.nvi.net>) says that it is "the World's first and possibly the only Native American Owned Internet Service Provider... Combining the latest in technology with a deep respect for all of creation, Native Voices International brings a unique perspective to the World Wide Web."

¹⁰⁰ Glinn Network One (<http://www.gnl.net>) advertises itself as "America's gay owned and operated Internet services provider." Glinn Network One offers gay content, links to the gay community, and donates ten percent of its gross revenue to gay and lesbian community organizations.

¹⁰¹ "Affinity Portals Deliver Niche Groups," USA Today, 8/6/99

¹⁰² The Christian Living Network (<http://www.christianliving.net>) is an ISP whose mission is "to strengthen the family unit by providing protection from the lure of pornography and to promote the will of God by providing financial resources to Christian causes." It advertises itself as "the industry leader in offering pornography filtering Internet access," and allows parents to control and monitor their children's Internet use. It donates 10% of gross revenue to the charitable organization of the subscriber's choice.

¹⁰³ Catholic Internet Services (<http://www.roman-catholic.org>) is an ISP that offers links to such Web sites as the Vatican, Catholic World News, Daily Bible Bread, and Cyber Rosary. It donates 100% of its profits to Catholic Charities USA.

¹⁰⁴ Family Connect (<http://www.familyconnect.com>) is an ISP that filters offensive material from the Internet before it is sent to subscribers. For those who already have an ISP they like and don't want to

and links to Web sites that suit their demographic group organized for them by their ISP. Subscribers may like supporting businesses from their own community. The people of the Yavapai-Apache Nation, who use Wild Apache Internet Services from the Verde Valley to host their Web site, may have a strong preference for doing business with the people at Wild Apache right at home in the Valley, rather than some large corporate entity in New York City. Many ISPs make donations to the communities they serve, and subscribers may like their donations targeted to their own community.¹⁰⁵

3.2.4. Variety is profitable for cable companies

Consumers' preference for variety means that open access would increase cable companies' broadband transport profit.¹⁰⁶ ISP variety would boost demand for cable modem service. Open access would not diminish cable companies' market power in the broadband last mile transport market, so they could charge the same or a higher price to more consumers, thereby increasing revenues and profits.¹⁰⁷

3.3. Migration of consumers from narrowband

The greatest immediate pool of potential cable modem users is current Internet users employing a dial-up connection over the last-mile. If competitive ISPs were able to offer service over the broadband cable network, they would encourage their customers to purchase cable modem service. Advertising cable modem services on ISP portals would be highly effective in increasing consumer awareness of cable modem service. Consumers would be more inclined to purchase cable modem service if they could do so without changing their ISP. With exclusive access, a vertically-affiliated ISP needs to

change, it also offers filtering unbundled from access for \$4.95/mo., a specific measure of the value of this type of variety.

¹⁰⁵ See the footnotes to the previous paragraph for examples of ISPs that target donations to the communities they serve.

¹⁰⁶ One of the econometric studies cited above shows how product variety results in higher firm profit. See A. Petrin, 1999, "Quantifying the Benefits of New Products: The Case of the Minivan," manuscript, University of Chicago Business School, available at <http://gsbwww.uchicago.edu/fac/amil.petrin/research/minivan.pdf>, verified 7/1/99.

¹⁰⁷ See Section 2.1.1 or Appendix A for a discussion of market power. I show that cable companies have substantial market power in the broadband last mile transport market, and that this power is not diminished

convince current Internet users to drop their current ISPs and switch. With open access, the current ISPs themselves become part of the marketing force moving customers towards broadband access.

3.4. Experts believe open access would be profitable for cable operators

The financial advantage of open access for cable operators has been noted both by analysts and cable companies. As mentioned above, Merrill Lynch believes it will be in AT&T's interest to provide access on its network to ISPs, even though doing so would create competition for its vertically-affiliated ISP, because it would "provide a strong wholesale revenue channel and provide potential future earnings benefits."¹⁰⁸ Jupiter communications says that "the cash inflow from reselling cable access might be too lucrative for AT&T to refuse and the company might agree to open up TCI's network."¹⁰⁹

In a proceeding in Canada, the trade organization representing Canadian cable operators, the Canadian Cable Television Association (CCTA) said that, "the CCTA is committed to the implementation of third party access, in large part because it is in the cable companies' financial interests."¹¹⁰ The CCTA went on to explain that open access helps to spread the fixed cost of broadband facilities over a larger customer base because unaffiliated ISPs bring subscribers to the cable network.¹¹¹

AT&T's own experts, Professors Ordovery and Willig, argue that cable operators have a strong financial incentive to offer a variety of content on their network. I will quote at some length from their declaration to the FCC. Although they discuss the advantages to

by open access, because it depends on the number and quality of substitutes for cable broadband last mile transport, and none are created by open access.

¹⁰⁸ See Merrill Lynch analyst's report, "AT&T Gets UMG and (Amazingly) Comcast JV Without Bidding War - Very Positive!," 5/7/99).

¹⁰⁹ "Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>).

¹¹⁰ Reply comments of the Canadian Cable Television Association in PN 98-14, 10/30/98, p. 2 (<http://www.crtc.gc.ca/internet/1998/8697/c12/02/ccta/981030fc.doc>).

¹¹¹ "Customers brought to the cable network by alternate ISPs such as AOL, will help to recover the considerable investment involved in rolling out high-speed access capability and the high proportion of

cable operators of supplying content, their argument works equally well for ISP services. As you read Ordover's and Willig's argument, every time they say "content," replace that word in your mind with the words "ISP services," and ask yourself whether the argument doesn't work just as well. I think it does. They say,

Our analysis will show that TCI, like all other cable providers, has a strong financial incentive to offer a wide range of internet content to its customer base. This is because the attractiveness of its broadband offering depends not only on the speed with which the customer can receive information from the internet but also on what the customer can get from the internet when it gets there. This gives TCI an ample reason to accommodate any reasonable requests by alternative content providers. If any such provider seeks to offer content that TCI's customers would find attractive, and the provider is willing to pay a compensatory access fee, it will be in TCI's interests voluntarily to come to agreement with the provider.¹¹²

Assume the bottleneck owner bundles its content with its access, and sells the package for some monthly subscription fee. Under this arrangement consumers cannot reach any other content through their subscription to the service. But is such an arrangement profit-maximizing? The answer is likely no, provided that there are some other sources of content that the bottleneck's actual and potential customers would find desirable. Indeed, by excluding the other content, the bottleneck owner diminishes the value of its scarce asset by some dollar amount that reflects the "average" consumer valuation of the available alternative sources of content.¹¹³

Just as consumers value a variety of sources of content, they value variety in ISP services. And if it is not profit-maximizing to exclude sources of content consumers find valuable, as Ordover and Willig assure us, why would it be profit-maximizing for cable operators to exclude sources of ISP services consumers find valuable? There is a strong possibility that cable company profits, and their incentive to invest in broadband last mile facilities would actually be higher in an open access environment.

high-speed access costs that are expected to be causal to the service as a whole but not causal to units of demand." (*Ibid.*, p. 3)

¹¹² See AT&T's and TCI's Joint Reply to Comments and Joint Opposition to Petitions to Deny or to Impose Conditions, CS Docket No. 98-178, filed Oct. 29, 1998 at "Affidavit of Professors Ordover and Willig," p. 13.

¹¹³ *Ibid.*, p. 14. Emphasis added.

4. Conclusion

Open access would increase the amount of broadband last-mile transport revenue cable companies receive. This may more than offset the reduction in vertically-affiliated ISP income. If so, open access would be good for cable companies' profitability, and open access would actually increase the incentive to invest in broadband last-mile cable facilities. In any case, even if there is not a net gain, any reduction in vertically-affiliated ISP income resulting from open access would be substantially offset by increased broadband last-mile transport revenue.

Even if an open access requirement were to reduce cable companies' profits, my analysis has shown that the worst-case returns on investment are extremely high, and more than sufficient to justify rapid, widespread investment. Cable operators will retain their market power in broadband last-mile transport, and thus will profit from investments in broadband last-mile facilities. Open access will decrease, not increase the riskiness of this investment. Further, it is in cable companies' interest to invest rapidly to capture market share early. The predictions made by some U.S. cable operators that investment in broadband facilities will be retarded by open non-discriminatory access simply do not make sense.

Appendix A

Market definition and market power

Market definition

There are two product markets relevant to this analysis. Roughly, a product market includes all goods or services that are close substitutes.¹ The first market is the "broadband last-mile transport market."² In this market, Internet service providers (ISPs), such as @Home and AOL, buy broadband last-mile transport from network providers, such as cable operators and local exchange carriers (LECs). The second market is the "broadband Internet services market," in which end-users purchase broadband Internet service from ISPs. In a submission to the Canadian regulatory commission, AT&T Canada Long Distance Services reached the same conclusions presented here: last-mile transport and ISP services are in distinct markets, and broadband last-mile transport is in a separate market from narrowband last-mile transport services.³

Follow the money

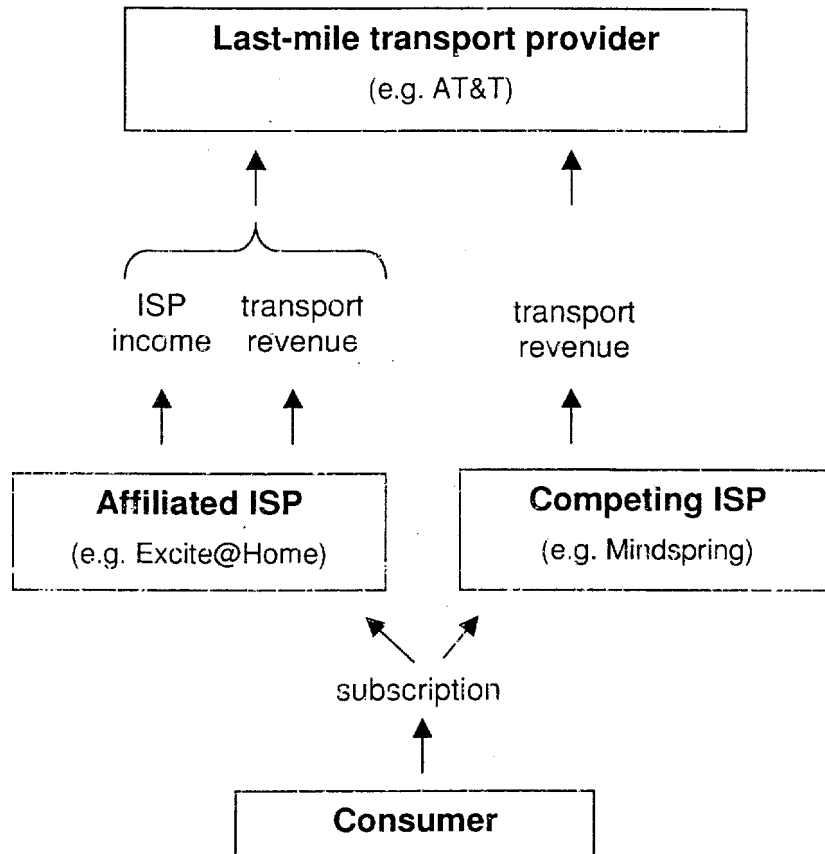
The diagram below illustrates the flow of funds in the broadband industry. It begins with consumers, who pay subscription fees to their ISPs. ISPs also receive revenue from advertising and e-commerce fees (not shown in the diagram). Two types of ISPs are illustrated in the diagram. I refer to ISPs that are owned in part by the cable operator

¹ To be more precise, a product market is the smallest set of services over which a monopolist, if one existed, could exercise market power. (See "Horizontal Merger Guidelines," U.S. Department of Justice and the Federal Trade Commission, April 2, 1992, Rev. April 8, 1997) Market power is the ability to raise price above the competitive level, lower quality below the competitive level, or impose restrictions on buyers that would not be found in a competitive market. Geographic markets are defined similarly. The geographic market for last-mile transport is local, since, e.g., cable modem service in Brooklyn doesn't substitute for cable modem service in Peoria.

² The critical issue in defining a product market that includes broadband Internet access is whether narrowband Internet service is a sufficiently good substitute for broadband service to impose restraint on a putative monopolist in broadband services. Narrowband Internet service cannot deliver many of the services broadband access can, such as full motion video, video conferencing, and high quality audio. Moreover, many consumers value broadband service simply for the speed with which they can download web pages. AT&T's economists argue that the fact that AOL's sales of narrowband service slowed in areas where cable modem service became available is evidence that narrowband service will put competitive pressure on broadband service. (See AT&T's and TCI's Joint Reply to Comments and Joint Opposition to Petitions to Deny or to Impose Conditions, CS Docket No. 98-178, filed Oct. 29, 1998 at "Affidavit of Professors Ordovery and Willig, p. 10") Sales of slide rules slowed when calculators were introduced, too, but that hardly means that sellers of slide rules could prevent a monopolist in calculators from exercising market power. The author of Forrester Research's report on broadband Internet access says, "Once consumers get a taste of high-speed Internet access at home, they'll never go back to dial-up." ("High-speed Internet Access To Reach 16 Million U.S. Households By 2002 According to Forrester," Forrester Research press release, 9/1/98, www.forrester.com/ER/Press/Releases/Standard/0,1358,21,FF.html)

³ See AT&T Canada Long Distance Services' Comments in Response to the Canadian Radio-television and Telecommunications Commission's Telecom Public Notice 96-36, 2/4/97, pp. 6-7 (<http://www.crtc.gc.ca/internet/1997/pn's/pn96-36/at&T/pn9636.doc>)

through whom the ISP offers service, such as Excite@Home, as “vertically-affiliated ISPs.” Cable companies, due to their ownership interest, receive a share of the income of their vertically-affiliated ISPs, labeled “ISP income” in the diagram.⁴ ISPs, whether vertically-affiliated or not, pay the last-mile transport provider a fee for each broadband subscriber; this is labeled “transport revenue” on the diagram.



Under open access, some end-users would switch from cable companies’ vertically-affiliated ISP to competing ISPs, reducing the affiliated ISPs’ revenue, and the portion of ISP income received by cable companies. However, this would not reduce cable companies’ transport revenue at all: cable companies would simply collect the same or more transport revenue from competing ISPs rather than from their vertically-affiliated ISP. Cable companies that do not own a share of a vertically-affiliated ISP do not get any ISP income, so their receipts will not be reduced by open access, and hence, neither will their incentive to invest in broadband facilities. The central finding of this paper is that transport revenue *alone* is sufficient to induce cable companies to invest in broadband last mile transport facilities.

⁴ Thirty-six percent of Road Runner’s profits flow to Time Warner, fifty percent go to MediaOne, and forty percent of Excite@Home’s profits go to TCI. The profits of TCI and MediaOne, in turn, including profits from both last-mile transport and their share of Excite@Home and Road Runner, will flow to AT&T, which owns TCI, and will own MediaOne if the merger is approved.

Market power

The economic principle behind this result is market power. Market power allows cable operators to charge prices for broadband last-mile transport that are sufficiently high that last-mile transport revenues alone justify investment. Market power depends on the number and quality of alternatives. When buyers have few or poor alternatives, producers are able to raise price above the competitive level – in other words, exercise market power. In the market for ISP services, there are many producers, and entry and exit are easy, so ISPs, even big ones, have little market power. But as I show below, incumbent cable operators will have substantial power in the market for broadband last-mile transport.⁵

Most analysts predict that cable and digital subscriber line (DSL) will be the dominant technologies in broadband last-mile transport.⁶ Satellite and wireless service will not obtain significant market shares in the next several years, if ever. One analyst predicts that satellite will have only 7% of the broadband subscribers in the U.S. by the year 2004.⁷ But even this small share overstates the extent to which satellite service will provide competitive pressure for DSL and cable broadband providers, since satellite may be relegated to low-density areas that are too expensive to be served by wirelines. For densely populated areas, DSL and cable TV will be more economical.⁸ Moreover, satellite service is a lower quality option, since it requires a phone link for upstream traffic, and phone links are generally narrowband. For this reason, satellite service does not currently meet the FCC's definition of broadband, which requires at least 200 Kbps in both directions.⁹ Even downstream, satellite offers less bandwidth than cable modem service, with advertised rates of 400 Kbps, and sustained bandwidths of about 225Kbps

⁵ AT&T Canada Long Distance Services agrees that cable operators that supply broadband last mile transport "have the ability to exercise significant market power through the control which they exercise over bottleneck broadband access facilities and through the dominance which they enjoy in their ... core business markets." (AT&T Canada Long Distance Services' Comments in Response to Telecom Public Notice 96-36, 2/4/97, p. i (emphasis supplied) (<http://www.crtc.gc.ca/internet/1997/pn's/pn96-36/at&T/pn9636.doc>))

[Cable operators] are not unlike the incumbent local telephone companies because they too control a bottleneck facility or essential input (i.e., direct access to the end-user) into the services that are provided by other carriers and service providers" (*Ibid.*, p. 1, emphasis supplied)

⁶ "There are only two viable plans for bandwidth freedom in the works: cable and DSL." ("DSL vs. The World," *PC Computing*, January, 1998. (<http://www.zdnet.com/products/content/pccg/1101/259442.html>) While analysts disagree about the market shares DSL and cable modem broadband Internet services will have in the future, there is widespread agreement that other technologies will not have significant market shares. See "Beaten to the punch," *Telephony*, Oct 19, 1998, "ADSL Will Overtake Cable," *Wired News*, 12/18/98, <http://www.wired.com/news/news/technology/story/16922.html>, and "Cable modems to win consumer market, study says," *America's Network*, Dec 1, 1998 v102 i23 p26(1) for three articles that discuss only DSL and cable broadband access.

⁷ See "ADSL Will Overtake Cable," *Wired News*, 12/18/98, <http://www.wired.com/news/news/technology/story/16922.html>.

⁸ See "Broadband satellite will be niche market," *Satellite International*, 1(14):1, September 09, 1998.

⁹ See *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, p. 9.

in practice.¹⁰ Not only is satellite a lower quality option, it is fairly expensive.¹¹ And satellite service is not an option at all for end-users without a clear view of the southern sky.¹² In its "Editor's Choice" column evaluating broadband alternatives, *PC Magazine* stated that satellite service is "a good solution for locations where neither cable nor DSL services have yet arrived."¹³

Wireless technology is still in its early stages, and has yet to overcome some basic problems, such as the effect of weather on transmission quality.¹⁴ Wireless service currently has very limited availability,¹⁵ and is not likely to capture a large share of the market.¹⁶ Wireless customers will be primarily businesses, not residences.¹⁷ The FCC says that "[a]lthough the marketing focus for most fixed wireless companies is currently on small and medium-sized businesses, some may begin offering limited residential service on this spectrum within five years."¹⁸ Since cable service is primarily for residences,¹⁹ wireless broadband will exert very little competitive pressure on the cable companies even in those few areas where it is available.

Not only are cable broadband and DSL the only two *technologies* that will provide economically reasonable substitutes for most consumers, but the incumbent cable operator and the incumbent local phone company (LEC) will be the only two economically reasonable *providers* of these services for most consumers in the near future. In most geographic markets, there is little or no significant competition from cable overbuilders²⁰ or competitive LECs. Even where there is a cable overbuilder, the overbuilder is likely to be a LEC.²¹ And where competitive LECs exist, they are not a meaningful infrastructure competitor because they simply lease lines from the existing

¹⁰ See "Satellite," *PC Computing*, March 31, 1999, (<http://www.zdnet.com/products/stories/reviews/0.4161.394270.00.html>).

¹¹ See "The Battle for the Last-mile," *The Economist*, May 1, 1999.

¹² See "Get Faster Access," *PC Magazine*, March 31, 1999, <http://www.zdnet.com/products/stories/reviews/0.4161.2233480.00.html>.

¹³ See "Editor's Choice," *PC Magazine*, 3/31/99, <http://www.zdnet.com/products/stories/reviews/0.4161.394275.00.html>.

¹⁴ See "The Battle for the Last-mile," *The Economist*, May 1, 1999.

¹⁵ See "The Faster Web," *PC Magazine*, April 20, 1999 p158(1).

¹⁶ See "Can You Find the Wireless Runner," *America's Network*, <http://www.americasnetwork.com/issues/99issues/990201/990201run.htm>.

¹⁷ See "The other side of wireless," *Telephony*, March 8, 1999, and "Can You Find the Wireless Runner", op. cit.

¹⁸ See *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, p. 23.

¹⁹ See "The Faster Web," *PC Magazine*, April 20, 1999 p158(1).

²⁰ An "overbuilder" is a cable operator competing for the same customers as an incumbent cable operator. Overbuilders are only present in a limited number of markets. Only about 1% of cable subscribers were overbuilders' customers in June 1998. (*Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 81 and Appendix B-1)

²¹ Of the 149 franchises issued to cable overbuilders, 87 of them were issued to Ameritech, 18 to BellSouth, 10 to GTE. (*Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, pp. 72-73)

LEC.²² Thus, the two incumbents will each have substantial market power because there are no good alternatives to their physical networks. Under the best of circumstances, last-mile broadband transport is likely to be a duopoly controlled by the incumbent local cable operator and the incumbent LEC in most geographic markets.²³ Whenever there is a small number of suppliers of a product for which there are no good alternatives, suppliers will have market power.

While the incumbent cable operator and LEC are likely to have a duopoly in the broadband last-mile transport market, the incumbent cable operator is likely to be the dominant firm in each geographic market. First, cable modem service has a first-mover advantage – residential cable modem subscribers already outnumber residential DSL subscribers by at least 3 to 1 (one estimate is as high as 28 to 1)²⁴ – and first-movers often retain market share as markets mature.²⁵ And in many areas, there will be no affordable,

²² Competitive local exchange carriers (CLECs) are a small presence with little effect in the market for last-mile broadband transport. CLECs lease most of their lines from ILECs and focus on business customers, so they are unlikely to exert much independent competitive restraint on the dominant suppliers of broadband last-mile transport. CLECs provide only about 3% of the switched access lines nationwide. Moreover, they lease most of the lines they supply from the incumbent carrier (see *Trends in Telephone Service*, February, 1999, Federal Communications Commission, p. 9-1), so the local phone company prices are a floor for the competitive carriers' prices. Many CLECs focus on the business market, or on the "small office, home office" market. (See "Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996," CC Docket No. 98-146, Federal Communications Commission, 1/28/99, pp. 7, 30) In mid-1998, CLECs had operational collocation arrangements in switching centers serving about 44% of business customers but only 25% of residence customers. (*Trends in Telephone Service*, February, 1999, Federal Communications Commission, pp. 9-1 – 9-3)

²³ Dale Hatfield, Chief of the FCC's Office of Engineering and Technology, agrees: see, e.g., "The Role of Wireless in Realizing the Broadband Future," remarks by Dale N. Hatfield at the Wireless Communications Assoc. 5th Annual Technical Symposium, 11/3/98 (http://www.wcai.com/ts98_hatfieldspeech.htm).

²⁴ According to the Yankee Group, cable modem installations outnumbered DSL connections by 17 to 1 (425,000 cable modems and 25,000 DSL connections) at the end of 1998. (PC Magazine, April 20, 1999 p158(1)) *Telephony*, citing Forrester Research, says that at the end of 1998, cable modems outnumbered DSL connections by 28 to 1 (700,000 cable modem subscribers and 25,000 DSL subscribers); the DSL figure didn't include every potential customer, but covers most of the major metropolitan areas. ("Beaten to the punch," *Telephony*, Oct 19, 1998 i0040-2656) Jupiter Research says that in 1999, residential cable modems will outnumber residential DSL connections by 3 to 1 (1.2 million cable modems and 400,000 DSL connections). ("Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>))

²⁵ Jupiter believes that cable modems will be the dominant consumer access technology because, in part, of cable modems' aggressive rollout schedules. ("Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>)) "There is a race to be first to offer Internet access and ultimately telephone service to the upscale neighborhoods that will buy it first," said Howard Anderson, president of the Yankee Group, a media consulting firm. "It's called the 'first-move advantage.' If customers go with the phone companies, it will be hard, if not impossible to lure them back to cable. So cable companies want to get big so they have as much cash flow as they need to build their Internet business. Size is everything." ("2 Huge Cable TV Companies to Unite in \$53 Billion Deal," *New York Times*, 3/23/99) (news folder) Petrin found that the first-mover advantage Chrysler obtained in the minivan market were significant – ten years after its introduction of the minivan, Chrysler still controlled over half the minivan market. (A. Petrin, 4/20/99, "Quantifying the Benefits of New Products: The Case of the

ubiquitous, mass market alternatives for residential consumers to cable broadband last mile transport. DSL service will have a smaller footprint because it cannot be supplied to households that are located too far from the telephone companies' central offices, or to households served by certain telephone company equipment that is incompatible with DSL. Estimates of the number of households that DSL cannot serve range from 20 to 50 percent,²⁶ meaning that cable modem service may be the only provider in up to 50% of residential homes. Most prominent analysts agree that cable modems will have a dominant share of the consumer broadband access market in the future.²⁷ Of course, even if cable companies do not dominate to duopoly, they will still have substantial market power since there will be only one other significant provider of broadband last mile transport services.

Minivan," manuscript, University of Chicago Business School, available at <http://gsbwww.uchicago.edu/fac/amil.petrin/research/minivan.pdf>, verified 7/1/99).

²⁶ The leading type of DSL service, ADSL, cannot currently be offered on copper loops longer than 18,000 feet, and over 20 percent of all U.S. lines exceed that limit. For high speeds, the maximum loop length is 12,000 feet. "With some 40 to 50 percent of the BOCs' copper lines falling over 12,000 feet, the market for high-quality ADSL services remains limited. It is also currently not possible to provide ADSL service over digital loop carriers (DLCs) (which work as aggregators, hooking up multiple lines into a larger pipe, such as a T-1). Up to 30 percent of copper lines in service are served by DLCs, and 50 percent of new lines installed are served by DLCs. Residences are far more likely to have loops longer than 18,000 feet or loops served by DLCs than businesses. ("Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>). Ameritech estimates that xDSL will not work on 45% of its loops today, and may never work on 20% of them (*Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, pp. 24-25).

²⁷ Forrester Research predicts that cable modem service will capture 80 percent of the residential broadband market, and DSL will take 20 percent ("High-speed Internet Access To Reach 16 Million U.S. Households By 2002 According to Forrester," Forrester Research press release, 9/1/98, www.forrester.com/ER/Press/Releases/Standard/0,1358,21,FF.html). Jupiter Communications projects that cable modems will outnumber DSL connections by two to one, and says that "cable operators are well-positioned to be the dominant providers of broadband access to residential customers in the future." ("Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>). I have not seen any analysts' predictions of such overwhelming dominance by DSL, though Allied Business predicts that DSL subscribers will outnumber cable modem subscribers by 2004 ("ADSL Will Overtake Cable," *Wired News*, 12/18/98, <http://www.wired.com/news/news/technology/story/16922.html>).

Appendix B

Investment analysis

1 Summary of results

The first column below shows revenue and investment per subscriber for cable TV alone. The second column shows the investment necessary to produce phone and broadband last-mile transport service given that cable TV facilities are already in place, and the additional revenue that would be produced by such an investment. Similarly, the third column shows the investment necessary to produce broadband last-mile transport service given that the facilities necessary to produce cable TV and phone service are in place, and the revenue that would result from such an investment.

	cable TV	incremental phone plus broadband	incremental broadband given phone
local phone rev. per. subs.		\$ 45	
toll phone rev. per subs.		\$ 5	
broadband rev. per subs.		\$ <u>26</u>	\$ <u>26</u>
total monthly rev. per subs.	\$ 42	\$ 76	\$ 26
investment per subs.	\$2,109	\$2,350	\$350
revenue per \$ investment	0.0199	0.0323	0.0743
better than cable by	—	62%	273%

Revenue per dollar of investment from phone and broadband is 62% greater than revenue per dollar of investment from cable TV service. Under reasonable assumptions, this means that, even if ISP income is zero, the return to investment in phone and broadband last-mile transport facilities is 62% above the normal rate of return;¹ this is certainly enough to provide incentive to invest. If it is taken as given that investment in phone facilities will take place, then investment in broadband last-mile transport facilities will yield a return 273% above the normal rate of return, making investment in broadband facilities extremely attractive.

¹ Investments that are expected to earn a return above the normal rate are worth making. See Section 3, below, for a discussion of the relationship between revenue per dollar of investment, net present value, and internal rate of return.